

February 2, 2003

Dr. Andrew Christensen, Chair
Space Science Advisory Committee

Dear Dr. Christensen:

The Origins Subcommittee met at NASA Headquarters on December 2 and 3, 2002. To open the meeting, I personally thanked the Origins Subcommittee for their excellent contributions to the 2003 Origins Roadmap, and to HQ personnel Phil Crane and Hashima Hasan, JPL's Navigator Office under the leadership of Mike Devirian, and the members of the astronomical community who have together produced an informative, thoughtful, and inspirational document. I am particularly pleased that the Origins Roadmap is becoming an important record of the evolution of the Origins theme, and believe that this three-year reappraisal cycle plays a crucial role in incorporating advances in both science and technology into the program. We were gratified to hear Anne Kinney report that the Origins Roadmap was very well received at the Mission Bay Strategic Planning Workshop last month. We thank Marc Allen for his report on the excellent progress in preparing the Space Science Enterprise section of the Strategic plan and were glad to hear that he also regarded the OS contribution as exemplary.

In our joint session with the SEUS on December 3, we were treated to a lively presentation of the SEU Roadmap by SEUS chair Rocky Kolb. The "Beyond Einstein" initiative is exciting and well crafted – the OS extends its complete support for its inclusion in the next budget cycle. Restoring the funding balance in the Astronomy & Physics program is essential for the health of the enterprise; we were delighted to hear of Ed Weiler's remark, at the Strategic Planning meeting, that the Beyond Einstein initiative is his highest priority for new funding.

We were grateful to Origins Theme Scientist Phil Crane for briefing us on the status of Origins missions and for Dr. Kinney's report, in joint session with the SEUS, of recent accomplishments and challenges of the very broad A & P Division. The OS was, of course, disappointed to learn that the launch of SIRTf will be delayed to April 15, 2003 and that there will be significant budget impact. Likewise, the slip of SM4 servicing mission of HST is the result of "launch congestion" – this postponement is unfortunate for WFC3 and COS and its cost implications will further strain an already stressed HST operations budget. It is possible that the delay of SM4 will play a positive role in our goal of keeping HST running until 2010.

The OS was delighted to hear from Phil that the telescope assembly for SOFIA, the Stratospheric Observatory for Infrared Astronomy, has been delivered and that the first test flight is planned in 12 months. An operating observatory is expected by December 2004. He also reported that Kepler is starting off well and that the first meeting of its Science Working Group had just occurred.

Phil told us the good news that vibration problems at the Keck Interferometer have been mitigated and that observations with the two Kecks are becoming routine. We were

pleased to hear that observations made with HIRES during NASA scheduled time with Keck will be archived and that thought is being given to how this might be extended to include other instruments. Phil made some particularly interesting and provocative comments on what he sees as the developing options for TPF and the challenge of determining some important parameters, for example, the frequency of Earth-like planets around solar-type stars, in the 2004-2008 time frame when such information could inform the technology choices for TPF. The OS has expressed similar concerns in recent meetings.

WFC3

The OS wants to express our thanks to Ed Cheng for his excellent work as Lead Instrument Scientist of WFC3 and wishes him the best in his future endeavors. Randy Kimble, Cheng's successor, reported to us on the substantial progress being made on preparing the WFC3 instrument for installation on HST during SM4. Major milestones include the acquisition and installation of most of the flight optics and filters, demonstration of outstanding image quality, and redesign of the thermo-electric cooler for the IR channel. In spite of significant challenges, the project remains within its budget cap. The Subcommittee was particularly excited to hear that a flyable IR focal-plane array is now in hand. The combination of good sensitivity and large field of view in both the UV and near-IR channels will greatly enhance HST's potential for new discoveries in the latter half of this decade.

COEL

J.C. Wheeler and J.I. Lunine presented via telecon the summary conclusions of the Committee for the Origin and Evolution of Life (COEL), which was tasked with assessing the direction and status of the NASA Astrobiology Institute (NAI) five years after its inception. COEL noted that although there are now many Astrobiology initiatives abroad (in Spain, the UK, Australia, France, and Russia), the US effort is widely considered to be the most mature and the most vigorous program. As the international pacesetter in this rapidly growing new field, the US NAI should be commended for its pioneering role; nevertheless, the COEL has a number of general suggestions and recommendations. These include 1) introducing a tighter definition of Astrobiology, 2) ensuring that all NAI nodes reapply every 5 years, 3) integrating the Astrobiology program and the NAI more into the NASA mission planning process, 4) broadening the proposal evaluation panels to include more astronomers, and 5) strengthening communication among the nodes and between the nodes, the interested scientific community, and the general public.

The COEL's major recommendation is to put more "astro" into astrobiology and to better integrate the NAI and astronomical communities – for example, Wheeler and Lunine pointed to a low level of participation of astronomers in the NAI and in its planning process. It is hoped that NAI will naturally evolve to include in its program more of the astronomical search for origins, however, the COEL thinks it might be prudent to study the feasibility and desirability of creating and funding a new institute, akin to NAI, dedicated to consortium-based science and technology development specifically relating to Astronomical Origins.

The OS strongly supports the better integration of astronomy and astronomical perspectives into the NAI in all its efforts and notes the significant overlap between the recent Astrobiology and Origins Roadmaps. At a minimum, the emergence of an astronomical focus group within the NAI is to be encouraged. However, the OS has reservations concerning the establishment of a separate institute, under the auspices of the NASA Origins program, devoted to the astronomical aspects of Astrobiology. Such a program would compete for funding with the NAI and would result in a further distancing of astronomy from the core NAI goals of establishing a fully interdisciplinary enterprise. Furthermore, the OS thinks that the virtual institute concept should be fully proven before the formation of an astronomical counterpart is even discussed. For these reasons, the OS thinks it premature, particularly in advance of the upcoming NAI proposal competition, to consider the formation of another institute. ***The OS recommends that at this time every effort should be made to encourage further integration of astronomy into the NAI. Even though the NAI is the responsibility of the Solar System Exploration Division, the OS would like to hear from the NAI on a regular basis on the continuing role of astrobiology within the Astronomical Origins theme.***

The NAI is a bold experiment: expectations have been high and scientific productivity in a rapidly developing field is not easily assessed. In the coming year the OS hopes to hear a better articulation of the goals of the NAI, as well as a convincing demonstration that the NAI is superior to, for example, a traditional grants program. ***The OS would very much value a presentation by the NAI director on these issues at its next meeting, including a summary of the scientific accomplishments of the NAI to date.***

JWST

As we requested at our July '02 meeting, we received a briefing on the Next Generation Space Telescope, now officially named the James Webb Space Telescope (JWST) in honor of former NASA Administrator James E. Webb. The OS congratulates the Project and HQ on completing a challenging selection process of the prime contractor for JWST, and welcomes TRW as the winner of that competition. We were very excited to receive from John Nella a detailed description of TRW's winning proposal; the TRW plan would certainly fulfill all of our scientific aspirations for JWST. Though extremely challenging, it is clear that TRW and its industrial team members have skills and experience that are well suited for this endeavor, so crucial to the Origins program.

The JWST Project at GSFC has assembled an outstanding team and is making good progress in the areas of mission architecture and further definition of the science instruments. With the selection of TRW, the instrument teams and centers, and the Science Working Group, a milestone has been reached in this premier Origins mission. The OS congratulates all the partners and expresses its enthusiastic support; we look forward to continuing our role of advising the SScAC and Anne Kinney in support of JWST. The OS also wishes to recognize the major contribution of Bernie Seery in his tenure as Project Manager and welcomes his successor Phil Sablehaus.

John Mather presented a status report on the Project's activities. Now that the prime contractor is on board, the first task for the JWST Team is a re-plan directed by HQ:

both the total cost of JWST and its phasing are out of bounds with respect to the projected funding profile for JWST. Similar re-plan activities led to a better SIRTf mission and a substantially reduced risk for SIM. Of course, the trade space that will be examined to bring the project into compliance is extensive and multi-dimensional; with a planned first report in January, 2003, there is little opportunity for the OS or others in the community to voice their opinions on priorities and preferences. Because of the rapid pace, the representation of the community by the JWST Science Working Group (SWG) is paramount. We trust the JWST Project and NASA OSS to ensure that the SWG is fully engaged and informed so that science priorities – arguably the most important input to the re-plan process – will inform all trade studies.

The OS believes that the understandable tendency to focus on aperture, cost, and schedule in the re-plan activity must be resisted if the particular mission that optimizes science capabilities is to emerge. We urge the JWST Team to absorb to the greatest extent possible lessons learned by the SIRTf Team, especially concerning issues of thermal testing, integration, and end-to-end testing – these “lessons-learned” include not only hardware but software-related and operational issues. Since SIRTf is right now going through final testing and launch preparation, this is a particularly opportune time for that capture.

After discussion, the OS chose to reiterate its position that the mid-IR instrument, MIRI is critical for mission success, so important, in fact, that we would consider a 6-m with MIRI as superior to a 7-m without. Of course, the trade is not between MIRI and telescope aperture: there will be other opportunities for substantial savings – for example, the possible simplification of the ISIM and rephasing of the program – that might be the best way to serve the best long-term interests of the JWST science program. We wish to make the point, perhaps yet to be fully appreciated, that a two-instrument JWST (near-IR spectrograph and near-IR camera) is extremely vulnerable to a major instrumental failure. Specifically, JWST’s extraordinary near-IR sensitivity means that, unlike the case with HST, ground-based telescopes will be able to do much less in the way of providing samples for JWST spectroscopic studies of distant galaxies. Similarly, the science contribution of JWST reduced to a single imaging instrument would be substantially diminished. With no possibility of instrument service or replacement, we believe that MIRI, in addition to complementing scientifically the near-IR instruments and offering huge gains over ground-based observations, is a bargain in terms of insurance.

A natural solution to the apparent misalignment in the funding profile of JWST is a slip in the schedule of approximately two years. This would in all likelihood open a larger gap between JWST and the end of HST operations. There is at present a considerable spread of opinion in the astronomical community regarding HST’s future after SM4 (presently scheduled for early 2005), including calls by some for an additional servicing mission to extend HST’s life and possibly to add new instruments. Although a slip in JWST is likely to increase pressure for additional HST servicing, the OS believes that the two issues should be decided separately, on their own scientific merits. ***Especially since the decision on HST’s future is not likely to be finalized in the next two months, the OS recommends that those involved in the replan do not attempt to weigh the impact on HST of different scenarios for JWST. On the contrary, the OS believes that this replanning exercise should be exclusively concerned by what is best scientifically and programmatically for the JWST mission alone,***

leaving other programmatic issues to Anne Kinney and her colleagues at HQ. Clearly the primary considerations in the replan should be reducing cost and mitigating risk while maximizing scientific potential. The OS feels strongly that the schedule on which JWST is completed is far less important than producing a mission with the broad, powerful science capabilities presently envisioned.

The OS would like to review and comment on the progress of the re-plan during our next meeting February 27-28 in Pasadena. We are particularly concerned about the short interval currently shown between re-plan, PDR and CDR for such a complex system; we hope that this concern will be mitigated as plans evolve.

SIM

Jim Marr, the SIM Project Manager, and Mike Shao, the SIM project scientist, updated the OS on SIM Phase A activities. We were very pleased to hear that the SIM project has met the difficult technology milestones required to enter into Phase B. In particular, performance results for the Kite and Micro-arcsecond Metrology (MAM) testbeds were presented. The “Kite” testbed demonstrates an external metrology truss employing a set of corner cubes in a planar configuration, that is, kite-shaped. The MAM testbed demonstrates SIM’s fundamental operating technique of measuring the angle between stars. Both of these testbeds have demonstrated narrow-angle performance exceeding the 3 micro-arcsec requirement, approaching the goal of 1 micro-arcsec. This is exceptionally good news from the point of view of SIM’s capability to detect extra-solar planets around nearby stars. The wide-angle “baseline” requirement of 30 micro-arcsecs – so important for SIM’s mission of precision astrophysical measurements – was surpassed with good margin in the Kite testbed. Wide-angle results from the MAM are yet to be determined, but they are expected to track the narrow angle performance. The OS applauds the steady, excellent progress by the SIM Project in meeting these technology milestones, and hopes that ongoing budget negotiations with HQ will permit SIM to enter into Phase B.

APWG

Doug Richstone briefed the OS and SEUS on the results of the meeting of the Astronomy and Physics Working Group. The APWG has several concerns regarding the R&A program, which is the lifeblood of many in the astronomical community. Specifically, the APWG repeated its call for more support for Laboratory Astrophysics, which the OS has previously endorsed. We note that, despite repeated endorsement for enhanced support for Lab Astro, including the McKee-Taylor report, no action appears to have been taken – we intend to raise the matter with Anne Kinney again at the next OS meeting to discuss what specific steps might be helpful. The APWG, in their discussion of balance in the R&A program, suggested that intrinsic scientific merit, programatics, and proposal pressure – in that order – should be the criteria of ongoing efforts to rebalance the program. The APWG also concluded that the distinction between LTSA proposals from junior and senior investigators should be put aside. The APWG is confident that junior investigators will do as well in open competition and that the stature of the LTSA program will benefit from ending this distinction. Finally, the APWG conveyed its opinion that there was insufficient focus to developing needed technologies to TRL 3-6 and that this is a problem that affects all of Code-S.

SAWG

Joel Bregman presented the results of the Science Archive Working Group meeting held in November 2002. The National Virtual Observatory (NVO) program funded by NSF has initiated a firm foundation for international cooperation. The SAWG believes that, to take full advantage of this system, the archival centers should have a plan for the development of NVO-related activities, especially a high degree of connectivity, to support the primary goals of the ASO and SEU Roadmaps. The SAWG identified the Astrophysics Data Centers Executive Council (ADEC) as the logical group to develop this plan and requested a “white paper” by their next meeting in April 2003. On a related issue, the SAWG felt that the use of common tools and methods in the data analysis systems for as wide a range of missions as possible would increase research productivity.

The subject of proprietary rights for data from NASA missions was also discussed by the SAWG. It was felt that a standard one-year proprietary period was appropriate for most missions, although exceptions should be allowed. For instance, shorter periods may be in the best interest of the community for Explorer missions, and in the case of some missions, such as discussed for GLAST, no proprietary period at all might be advantageous. Such decisions can be made on a case-by-case basis, with the overriding goal of producing the best science. Finally, on MO&DA issues, in concurrence with the APWG, the SAWG feels that the LTSA program should drop the junior/senior distinction.

NAAAC

Abhijit Saha reported on the first meeting of the National Astronomy and Astrophysics Advisory Committee, a group formed to encourage cooperation between NSF and NASA on scientific priorities for the astronomy and astrophysics community as set, for example, in NRC studies such as the McKee-Taylor and Turner reports. The OMB (and OSTP) would like to see an integrated, national plan for all of astronomy and astrophysics, eventually encompassing other agencies and sources of funding. OMB views the recommendations of the McKee-Taylor Decadal Report as “complex” in the sense that their scope requires the pooling of resources. Following recommendations from a blue ribbon committee and input from both NASA and NSF, the NAAAC was launched as an experiment to see if such an advisory committee could be effective in facilitating this cooperation, or whether a more authoritative body – such as a national astronomy board – is necessary.

In its first meeting, the NAAAC, chaired by Bob Gehrz, reviewed cases of successful cooperation, such as the 2MASS 2-Micron All-Sky Survey and the Antarctic Meteor Program, but urged that such cooperation could be expanded to more ambitious programs, for example, the Large Synoptic Survey Telescope recommended in the McKee-Taylor Report. There are several challenges to more and better cooperation, among them, budgetary and cultural differences; the extensive advisory structure for NASA Code-S has no counterpart in NSF astronomy. ***Although there remains a good deal of skepticism about what this group might accomplish, the OS recommends NASA take a very proactive stance at this time – OMB’s preference***

for increased cooperation has been expressed in clear terms and should be taken seriously.

NEXT

Finally, we heard presentations on the NASA Exploration Team from Harley Thronson and "Space Architect" Gary Martin. The possibility of future integration of the human space flight program with ambitious future science missions is intriguing, and no one can deny the crucial role of astronauts in the brilliantly successful mission of the Hubble Space Telescope. Although the capabilities to work beyond LEO are more than a decade off in the best of circumstances, the OS agrees with the idea that driving this development by the needs of science programs is a good course to follow. In planning for ambitious human activity in support of space science it may be useful to start thinking again about facilities with 10-30 year lifetimes with upgrades and maintenance built in from the start. In specific reference to the Origins program, we see that the ability to assemble and test giant space telescopes through the use of robotic, human, and autonomous resources in HEO or beyond as a major, perhaps crucial capability in the decades ahead. In particular, although the pace of development dictates that JWST and TPF are unlikely to benefit from this capability, the Lifefinder mission of the Origins program is so broad in scope and sufficiently far off in the future that it might make sense to develop a specific plan for Lifefinder in the context of human assisted construction and testing. ***The OS requests that Anne Kinney consider inviting the scientists and engineers at JPL who are thinking about Lifefinder and future large-apertures in space to address the OS at our February meeting with this particular topic in mind.***

We look forward to the next OS our meeting, February 27, 28, 2003, at JPL in Pasadena.

Sincerely,

Alan Dressler, Chair, for the Origins Subcommittee